DOCUMENT RESUME

ED 199 385 CE 026 984

AUTHOR	Visser, B. L.
TITLE	Electroencephalographic Assessment in Vocational Counselling. Special Report.
INSTITUTION	National Inst. for Personnel Research, Johannesburg (South Africa). Council for Scientific and Industrial Research.
REPORT NO	CSIR-PERS-296; ISBN-0-7988-1661-9
PUB DATE	Mar 80
NOTE	49p.
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Adolescents; Behavior Problems; *Career Counseling; Disabilities; *Electroencephalography; Individual Characteristics; *Learning Disabilities; Learning Problems; *Medical Evaluation; *Mental Disorders; Personality Assessment; Personality Problems; *Physical Disabilities; Testing; Young Adults
IDENTIFIERS	*Client Characteristics

ABSTRACT

A study examined the role of electroencephalograms (EEGs) in vocational counseling. A total of sixth-eight subjects, fifty of whom were under twenty and seventeen of whom were between the ages of twenty-one and twenty-nine, were referred for EEGs after being diagnosed as having concentration and learning difficulties. Various members of this group of EEG candidates were given high or intermediate batteries of tests for mental alertness, arithmetic problems, reading comprehension, and vocabulary. (Not all candidates took the same tests.) Their scores were compared to those of the normal population; EEG group scores were significantly lower on all tests. The EEG group was divided into three groups, depending upon whether they had no, minor, or severe psychologically-oriented defects such as epilepsy, head injuries, or brain damage. Data analysis revealed that severity of complaint had no bearing on test results. Type of defect did, however, figure significantly in test results. It was concluded that EEG findings may be useful as an aid to counseling, provided that they are considered as an extra variable, possibly contributing additional information to the sum total of information about the individual. (MN)

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ED199385

SPECIAL REPORT

PERS 296

ELECTROENCEPHALOGRAPHIC ASSESSMENT IN VOCATIONAL COUNSELLING

B L Visser

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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CSIR Special Report PERS 296 (pp. i - vii; 1 - 40)
UDC 37.048.4: (612.822.3)
Johannesburg, Republic of South Africa, March 1980.

CE 026 984

ISBN 0 7988 1661 9 CSIR Special Report PERS 296

Published by

National Institute for Personnel Research
Council for Scientific and Industrial Research
P O Box 32410
Braamfontein
2017

Printed in the Republic of South Africa by
National Institute for Personnel Research

ACKNOWLEDGEMENTS

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SUMMARY

Electroencephalograms (EEGs) were recorded from a number of clients who originally came to the NIPR for vocational counselling. Indications for EEG examination were lack of concentration, restlessness, behaviour problems and attendant academic under-achievement or vocational instability. This report describes the clients, some results and ideas on how EEG findings can contribute to vocational counselling.

OPSOMMING

Elektroenkefalogramme (EEGs) is opgeneem van 'n aantal kliente wat oorspronklik na die NIPN vir beroepsvoorligting gekom het. Aanduidings vir EEG-ondersoek is gebrek aan konsentrasievermoë, rusteloosheid, gedragsprobleme en gepaardgaande akademiese onderprestasie en beroepsonstabiliteit. Hierdie verslag beskryf die gevalle, sommige resultate en 'n paar gedagtes oor hoe EEG bevindings tot beroepsvoorligting kan bydra.

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1. INTRODUCTION

1.1 Background

Vocational counselling may be defined as the process by which individuals are helped to see and accept an integrated picture of themselves and the contribution they can make in the world of work. They are encouraged to test their self-concept against reality and to convert this to reality, to their own satisfaction and to the benefit of the community as a whole. However, attainment of even part of this ideal can be a daunting and difficult task, so all available resources should be used to facilitate the counselling process.

For many years the NIPR has offered a vocational counselling service to people who have difficulties in their initial choice of career or in adjusting to their study or work environment. Once the counsellor has obtained both objective measures and subjective impressions of the clients' capabilities and aspirations, an attempt is made to help the clients to evaluate these findings, to weigh priorities and finally, to consider possible solutions

During the course of counselling, anomalies often arise which make it difficult for the counsellor to understand the nature of the problem and therefore to clarify it for the client. An individual who has difficulty in adjusting to, and coping with, the demands of school, university or the work situation needs to know what to do about it. Similarly parents, family, teachers, employers and others intimately concerned with the person are in a better position to facilitate his adjustment if the causation is fully understood. With better insight into the problem, parents can adjust their own expectations in relation to the achievement and career development of their children.

Among the numerous psychological and physiological factors contributing to vocational and educational maladjustment is an inability to use intellectual potential effectively. Sometimes there also appears to be no convincing explanation for certain behaviour patterns.

Counsellors refer these problem cases to medical practitioners, clinical psychologists, social workers, psychiatrists, remedial reading specialists and neurologists. Behaviour problems, learning problems and personality disorders may however be associated with EEG abnormality. Counsellors have thus, from time to time, requested that an EEG be recorded by the Neuropsychology Division of NIPR, in order to assist in determining whether symptoms are organically based, so that the case may be referred to the appropriate specialist.

1.2 Objectives of this study

Initially no formal research project was intended or planned when these cases were referred for EEG. In general the referrals were made merely because the counsellor was puzzled or suspicious about some aspect of the client's behaviour, test results, achievement or some combination of these factors.

After a number of cases had been referred, an unpublished report by Murdoch (1971), of the NIPR, described 37 of these cases and concluded that EEG findings did not make any appreciable contribution to the career recommendations that were made. In another report, also unpublished, by Visser (1972), 42 cases were described (an extra five cases were added to those in the Murdoch study). The claim was made that the EEG findings did in fact contribute materially to the approach taken by the counsellor in the overall counselling process, even though the actual career recommendations might not necessarily have been affected.

It was decided to update these preliminary studies to include those cases that were referred for EEG up to the end of 1978. Some of the more recent clients were tested on neuropsychological measures in addition to the EEG. This report is intended to direct attention to those aspects of behaviour that could be organically based and, thus, amenable to medical treatment, and also to illustrate that psycho-neurological findings can play a role in the assessment of, and prognosis for, people in work and study situations. Counselling recommendations may be influenced by such additional information.

2. VOCATIONAL COUNSELLING AT THE NIPR

2.1 NIPR vocational counselling clients

Most of the subjects who come to the NIPR for vocational counselling do so of their own volition. A small number are, however, referred by general practitioners, psychologists, teachers, psychiatrists, lawyers and personnel managers for special assessment.

Though the reasons given by clients for requesting counselling vary, the most often mentioned reasons are to obtain:

i) assessment of abilities and interests;

ii) prediction of academic and vocational success;

iii) clarification of vocational objectives;

iv) suggestions regarding choice of one particular career or information about a number of suitable careers;

v) confirmation of their own choice of career;

vi) suggestions on how to adjust to career problems.

2.2 Vocational counselling procedures

The clients spend a full day, or more, at the NIPR, during which they are tested and then interviewed by a counsellor. A report reflecting results and containing recommendations is forwarded to the client or the parents. Clients are invited to return at a later stage for further discussion, if this is desired. Parents are consulted when this is considered necessary by the counsellor or requested by them. The counselling in the NIPR context is not on-going, but is seen as a one-stop process to help individuals through decision-making crises which occur in the normal course of life.

2.2.1 Test batteries

A test battery is chosen to suit the particular needs and educational level of the client. The basic battery consists of:

i) a biographical questionnaire which covers such areas as education and training, home background, health and leisure-time pursuits;

ii) intellectual ability tests (verbal and non-verbal reasoning tests);

iii) scholastic ability tests (arithmetical reasoning or computation, reading comprehension and vocabulary;

iv) special aptitude tests (mechanical comprehension, perceptual ability, clerical skills);

v) projective tests (incomplete sentences, self-descriptions);

vi) an interest inventory (either the Kuder Preference Record (Form C) or the Rothwell-Miller Interest Blank);

vii) a vocational needs scale for assessing occupational priorities.

2.2.2 The counselling interview

The interview with a counsellor takes place near the end of the day's testing and usually lasts from an hour to an hour and a half. For the counsellor there are three major phases in the interview:

i) obtaining information on the client's personal history, views, feelings and aspirations;

ii) giving test results to the client and discussing these in relation to past and present achievement and future ambitions;

iii) discussing information garnered in (i) and (ii) in relation to careers and making suggestions about how to overcome any problems and difficulties.

The way in which the counsellor goes about counselling depends to a large extent upon the counsellor's own personality and theoretic orientation. Emphasis is placed upon obtaining good rapport with the client and making practical and helpful suggestions, particularly relating to realistic self-appraisal on the one hand, and accurate assessment of the job market and occupations on the other.

2.2.3 The counselling report

The report serves as a written reminder of the test results and their relevance to achievement in other spheres, and the final suggestions of the counsellor. Predictions of academic success are made as well as suggestions about job situations and occupations. An attempt is made to bring clarity to the problem by identifying major issues and priorities, and by outlining alternatives and possible solutions. A full account of the vocational counselling methods (Visser, 1977) can be referred to, should more explicit detail be required.

3. PROBLEMS ARISING IN THE COUNSELLING SITUATION

Counsellors periodically find during the counselling that ambiguities exist for which there are no clear explanations. Factors relating to discrepancies between ability and achievement have to be examined in detail in order to counsel wisely regarding the clients' career objectives and general adjustment.

Clear cases of confirmed head-injury, and epilepsy which is recognized and controlled, do not present a diagnostic problem in addition to a counselling one. However there are numbers of clients who mention incidents such as fainting, dizziness, blackouts and concussion and the

counsellor has little idea how far-reaching the effects of these occurrences are in relation to maladjustment or behaviour deviation. It is not improbable that these may be unrecognized epileptic symptoms.

It is not suggested that it would be feasible to refer for EEG every client who reports having fallen out of a tree, into a swimming pool or off a motor-bike. If these incidents do not seem to affect the lives of the clients, no undue emphasis or importance need be accorded them. If, however, a client is strongly motivated to succeed academically, for example, is reasonably competent intellectually and spends hours in study, all to no avail, further investigation is necessary.

There are numerous minor symptoms or conditions which may be epileptic manifestations or be related to other neurological syndromes. These are, inter alia, periodic temper tantrums, somnambulism, facial "tics", momentary lapses in attention, abdominal pain, enuresis, migraine, episodes of déjà vu, falling asleep at inappropriate times, disorders of movement, as well as a history of fainting and black-outs.

Head injuries may have sequelae, including epilepsy, hyperkinesis, reduced attention span, memory disorders and personality changes as well as reduced cognitive function. Infections of the brain (encephalitis) and its protective coverings (meningitis) may also result in more or less permanent cerebral impairment reflected in mental deficiency, hyperkinesis and behaviour and personality changes and personality disorders.

3.1 Rationale for referral of cases for EEG

The relationship between EEG abnormality and structural cerebral disorders and the epilepsies is well established (Kiloh and Osselton, 1966). Murdoch (1971) states that "the association between electrocortical disturbances, particularly of a sharp-wave type, and clinical manifestations of epilepsy, and between brain damage manifested clinically in loss of consciousness after head-injury and focal or generalized slow-wave activity, has been so well documented by numerous investigators that further comment is unnecessary".

On the other hand, however, a normal EEG, in the light of indisputable clinical evidence of cerebral damage (a paradox first described by Williams) has grave prognostic implications (Kiloh and Osselton, 1966).

Although a great deal of research has been done regarding the association between EEG abnormality and behaviour deviations and mental disorders of apparently non-organic origin, little has been proved conclusively. Jasper (1938) showed that more than half the children in his sample with behaviour deviations had abnormal EEG patterns. These children were described as being over-active, easily distractible and as displaying short attention span, unpredictable performance, extreme emotional responses, anti-social behaviour, as well as poor arithmetical ability. Similar behaviour syndromes have been described more recently under the rubric of "minimal brain dysfunction", "minimal cerebral dysfunction" and "organic brain syndrome". Clements (1966) in his definition of MBD (Minimal Brain Dysfunction) describes children of average or above average intelligence with certain learning or behavioural disabilities. He states: "deviations which may all manifest themselves by various combinations of impairment in perception, conceptualization, language, memory and control of attention, impulse or motor function".

A study by Murdoch (1973), on a group of MBD children showed a significantly higher incidence of slow-wave abnormality and evidence of a higher subcortical excitability than a control group matched for age and sex. Moreover, in that study a reassessment after a period of eight months showed that EEG differences between control and experimental groups were reduced, possibly as a result of physical maturation or the remedial procedures they had undergone. It seems thus reasonable to assume, or at least hope, that some counselling cases who suffer from learning difficulties and who display symptoms comparable with those of MBD children, will improve in time and/or with remedial training. On the other hand, it has been shown that the over-active child, as he becomes older may well become delinquent or psychotic. (Stevens et al, 1968).

Ellingson (1954) reports that schizophrenics have a higher incidence of EEG abnormality than normals and that psychoneurotics do present minor irregularities in the EEG.

Aggressive behaviour is frequently associated with EEG abnormality; for example, in the case of psychopathic and non-psychopathic criminals a fifty to sixty percent abnormality incidence has been observed. The maturational retardation theory has been put forward to explain EEG abnormality amongst psychopaths. Murdoch's (1971) study showed that aggressive psychopaths displayed significantly more abnormal responses to photic stimulation and hyperventilation than did non-aggressive psychopaths and non-psychopaths. The EEG interpretation of a maturation defect or cortical immaturity (related to focal and generalized slow-waves respectively) in subjects with behaviour disorders suggests the possibility of a normalization of pattern (Kiloh and Osselton, 1966) and speculatively, a concomitant behavioural improvement. In other words, the prognosis for a behaviour deviate whose EEG gives evidence of cortical immaturity may be relatively optimistic since there is a chance that the EEG may become normal and that behaviour problems will subsequently be reduced. From a counselling point of view, the knowledge that there is a possibility of improvement in the condition after a period of time, may have important implications.

Ellingson (1954) states that making allowances for differences and difficulties in the clinical diagnosis of the subjects and in criteria for normality of the EEG, the EEG is not valuable in the differential diagnosis of mental disorders and personality disorders. For the counsellor's purposes, a clinical diagnosis is important, but it would certainly not be the objective of obtaining results of psycho-neurological measures. The primary aim would be to gain more insight into the individual's difficulties, because the EEG <u>can</u> aid diagnosis in neurological or organically-based syndromes which may affect prognosis and thus the type of counselling given.

4. METHODS USED IN THE EEG INVESTIGATION

The electro-encephalographic investigation and other neuropsychological assessment measures were carried out by the personnel of the Neuropsychology Division of the NIPR. Several of the clients had EEGs done on the same day as they were tested and interviewed. Others had EEGs within a few days or weeks of this date.

4.1 EEG Recordings

EEGs were recorded over a period of more than 10 years on a number of electro-encephalographs. Eight and sixteen channel Elther and eight channel Galileo electro-encephalographs were used. Recordings were made with the subjects in the waking state, electrodes being positioned according to the International Ten-Twenty system (Jasper, 1938). Photic stimulation and hyperventilation were performed whenever possible.

4.2 EEG Analysis

One of the problems in evaluating research in EEG is the difference in criteria of abnormality, as few electro-encephalographers have identical standards. However, in this study all the records except two were reported on by Murdoch, thus reducing possible inconsistencies in the interpretations.

Analysis of the EEG records was carried out by visual inspection. Interpretation of the possible significance of the EEG findings was made in the light of the subject's history of head trauma, seizures and other clinical signs. This procedure was followed with a view to implementing or aiding counselling by making EEG results available to the subject's medical practitioner or specialist with the minimum delay.

4.3 The EEG Reports

The EEG reports were submitted to the counsellors as well as to medical practitioners on request.

These reports described the main features of the electrical activity and made an overall statement about its significance. The EEG's were described as either abnormal, moderately abnormal, mildly abnormal or normal. No severely abnormal EEG's were seen.

The electrical activity was described as being compatible with:

i) epilepsy or containing epileptogenic characteristics i.e. paroxysmal or episodic generalized sharp- and/or slow-wave activity, usually implicating more than one cortical region;

ii) heady injury i.e. focal slow- or sharp wave activity or moderate generalized cortical slowing, with additional involvement of one or more cortical areas;

iii) cortical immaturity or maturation defect i.e. generalized slow activity, focal slow wave runs involving post-temporal areas;

iv) non-specific cortical dysfunction i.e. focal slow- and sharp-wave activity;

v) normality.

4.4 Neuropsychological Assessment

More recently, some clients have been referred for full neuro-psychological assessment which, as well as EEG, includes either or both of the following tests:

i) Halstead Neuropsychological Test Battery for adults.

ii) S A Wechsler Adult Intelligence Scale.

5. DESCRIPTION OF THE SAMPLE

5.1 Subjects

The total number of subjects referred for EEG and included in this study was 68, of whom only seven were girls. This number includes the original samples of Murdoch (1971), and Visser (1972) and represents a very small proportion (less than one percent) of the total number of ccunselling clients seen during that time (1965 to 1978). Most of the subjects came to the NIPR for vocational counselling in the normal way, and were referred for EEG only on the counsellor's initiative.

On the whole, the group comprised White South African adolescents only ten of whom were Afrikaans-speaking. Fifty of them were under 20 years of age, seventeen were between 21 and 29 and only one was over thirty. The mean age of the total group was 19,98 years (see Table II).

The majority of the group was either still at school or university or in the early stages of working life.

In some cases clients and/or their parents were not prepared to co-operate in further investigation. Reasons for wanting the EEG performed could rarely be stated explicitly by the counsellor since it was inadvisable to cause alarm or misunderstanding. Most people were, however, prepared to co-operate when they understood that having an EEG was an attempt to elucidate and clarify the nature of their concentration and learning difficulties. The main reason given for a negative response came from parents who did not wish their children to think there was anything wrong with them.

5.2 Counsellors

Forty-six of the subjects were referred by one counsellor, four by another and the rest by ten other counsellors.

5.3 Test Results of the Total Group

Not all subjects completed the same battery of tests, as the educational level of the subjects differed. The majority of the subjects completed the same version of Raven's Progressive Matrices, however. This is an inductive reasoning test which is not related directly to formal schooling; it measures the ability to comprehend relationships within a pattern. Matriculated subjects and those in their matriculation year completed tests of mental alertness, arithmetical reasoning, reading comprehension and vocabulary of the High Level Battery; those with a lower level of education (approximately Standard VIII or IX) did a similar battery of tests on the Intermediate level. The clients sometimes completed other special tests but there were too few of them to include the results here.

TABLE I : SIGNIFICANCE OF THE DIFFERENCE BETWEEN TEST SCORE MEANS OF THE EEG SAMPLE AND THOSE OF LARGER NORMAL POPULATION GROUPS.

Test		EEG Group		Population Group		$\frac{\bar{x}}{\bar{x}}$
		Mean	N	Mean	N	
Intermediate Battery	Mental Alertness	15,01	20	16,43	205	- 1,302
	Arithmetic Problems	8,89	19	13,47	205	*- 3,598
	Reading Comprehension	9,84	19	10,68	205	- ,959
	Vocabulary	13,53	19	15,28	205	- 1,216
High Level Battery	Mental Alertness	19,34	44	23,57	509	*- 4,563
	Arithmetic Problems	5,30	43	6,30	200	- 1,890
	Reading Comprehension	9,21	43	10,03	507	- 1,568
	Vocabulary	12,23	43	10,20	506	* 2,938
Raven's Progressive Matrices A/15		28,48	64	31,30	508	*- 6,157

*An asterisk denotes those values which are significant at $\alpha = 0{,}001$

The means of the test scores obtained by the EEG group can be seen in Table I. These are compared with the means of larger population samples. The Population Group means for the Intermediate Battery are those of a group of male clerical staff with 9 to 11 years of education. For the High Level tests the means are derived from vocational counselling clients (1975 to 1977), i.e. matriculants aged from 16 to 20 years of age. These groups approximate the EEG group in terms of age and educational level, but only English-speaking group means were used. Since the number of Afrikaans-speaking people (10) in the EEG group was relatively small, this is probably not an important factor. The mean score for English-speaking clients on Mental Alertness and Raven's Matrices, for example, are respectively, 23,57 and 31,30, and for Afrikaans-speaking clients 21,03 and 30,20.

It can be seen in Table I that the EEG group scored generally less well on tests than a normal group. This is to be expected since many of the subjects were referred for EEG for poor academic achievement as well as for neurological problems.

Critical values for the significance of the differences between the means were obtained from the unit normal distribution (Siegel 1956, Table A). These showed significant differences between the two groups. Not only were the means significantly lower for the EEG group on the Raven's Progressive Matrices Test, but also on the High Level Mental Alertness test and the Arithmetical Problems test on the Intermediate Level. It can be assumed that both the fluid and crystallized intelligence of the EEG group was lower than that of larger normal-population samples. This is not an illogical assumption, considering the number of clients with head-injuries and epilepsy who could have been retarded mentally by their injuries.

The fact that the EEG group scored significantly better on the High Level Vocabulary test is anomalous. It may be a function of the test itself. The test is considered to be difficult and the latest norms show a decline of scores on this test over the last twelve years. The 1965 to 1967 mean score for Vocabulary is 11,852 and the 1975 to 1977 mean score is 10,20. Since the [illegible] of the group was tested some time ago, it would perhaps have been more meaningful to have compared

the High Level scores with those of earlier norm groups. On the other hand, it can be argued that the High Level group had achieved a reasonably high level of education, perhaps through considerable and unusual application and effort and had thus acquired a relatively high level of vocabulary - a learned skill - though they had not managed to apply it effectively on the scholastic tests.

Stevens et al (1968) report that in their study, behaviour problem children scored lower than control groups on scholastic achievement tests, though scores on Raven's Progressive matrices were significantly different from only one of the two control groups. These workers reported normal EEGs in 47 percent of behaviour problem children.

6. CLASSIFICATION OF THE EEG SAMPLE

In order to segregate the physiologically more "normal" cases from those that appeared to have more psychologically oriented defects, the subjects were divided into three groups, according to the severity and nature of their complaints:

GROUP I — Clinical - consisting of cases with known and treated epilepsy, severe head injury and congenial or long-standing brain damage.

GROUP II — Borderline - consisting of clients reporting fainting, isolated black-outs or epileptogenic episodes.

GROUP III — School and Behavior Problems - consisting of clients with school and learning problems, behaviour difficulties, sometimes of a psychopathic nature.

An attempt was made to be consistent in classifying the cases, but information about injuries and illnesses was rarely obtained from medical sources, therefore discrepancies could easily have arisen in assessing their significance and severity. Some clients may never have known about or may have forgotten some trauma, e.g. birth injuries, or not recognized the significance of certain episodes, and therefore did not report them.

The three categories are not mutually exclusive. Nearly all the clients complained of some learning or concentration problems, but only those who did not report any signs of head injuries or epileptogenic disturbances were included in Group III.

6.1 The "Clinical" Group. (Group I)

Group I (N = 26) was divided into three subgroups.

i) Epilepsy (N = 6)

Clients who, at the time of testing, were known to be epileptics and had had treatment were put in this subgroup. One of these was discovered to have had infantile convulsions only, but was nevertheless included. All those in this group had been to normal schools; two of them had a Standard 8 education, the rest were either in matric or had matriculated.

ii) Head-injury (N = 17)

This subgroup comprised clients who had suffered some form of head-injury sometimes associated with skull fracture and/or a period of unconsciousness, and sometimes with epilepsy, deafness, dizziness or black-outs. Approximately half of these clients were at that time receiving treatment for behaviour problems or emotional instability, conceivably related to the brain injuries. These were, in a number of cases, referred to the NIPR for counselling by psychiatrists or social workers. Thirteen of this sub-group had reached matriculation level.

iii) Long-standing Brain Damage (N = 3)

One of this subgroup had suffered hydrocephaly in infancy, but had reached Standard 8 level at a special school. Another had not reached any formal level of schooling at a special school, though he could read and write - he had been retarded from birth. The third had suffered "possible" anoxaemia during an operation in early infancy, but had been

to normal schools and had matriculated. All three were tested on other neuropsychological measures as well as EEG.

6.2 The "Borderline" Group (N = 19). (Group II)

This Group was sub-divided into three.

i) Isolated Black-outs (N = 9)

The majority of these clients had suffered occasional fainting or dizzy spells or had a history of one "black-out". In addition there were usually concentration problems and/or learning or reading disabilities. A post-encephalitic, who had one nocturnal episode, was included in this group.

ii) Slight head-injury or concussion (N = 6)

Only those clients who presented problems in career-related areas, as well as a history of minor head-injuries, were included in this group. Some of these clients also complained of problems in concentrating or suffered personality and/or behaviour difficulties.

iii) Epileptogenic syndromes (N = 4)

Clients who reported mild symptoms associated with epileptogenic syndromes were included in this subgroup. These cases all had difficulties relating to achievement and interpersonal relationships. Several other clients had had encephalitis, were stutterers or had facial "tics", but were classified elsewhere, as these were among the so-called "minor" symptoms that were presented.

The educational level of Group II as a whole was mainly matriculation; only six had left school after Standard 8 or 9.

6.3 The Behaviour and School Problem Group (N = 23). (GROUP III)

In this group the clients did not suffer from any specific EEG-related physiological problems that could readily be identified.

i) Serious behaviour problems (N = 8)

Five of this group had been referred by psychiatrists or psychologists. The problems ranged from very serious crimes (e.g. homicide, attempted suicide) to criminal or anti-social psychopathic-type behaviour (e.g. breaking and entering, dagga-smoking, car-stealing, truancy and alcoholism). Interestingly enough, the two highest scorers on the non-verbal reasoning test (Raven's Progressive Matrices) came from this small group.

ii) Mild behaviour and school problems (N = 15)

Those in this group suffered relatively mild problems involving emotional lability and personality difficulties, underachievement, non-achievement and dyslexia. One of this group was a paraplegic as a result of an accident and was experiencing problems in adjusting to study; he was thus referred by the attorney handling his case. The rest of the group had come voluntarily to the NIPR in the usual way for vocational counselling. It is interesting to note that only two of this group were girls; it is reported that about 90 percent of those with a behaviour disorder syndrome are males (Stevens et al, 1968).

7. ANALYSIS OF TEST RESULTS OF THE THREE GROUPS

In view of the significant differences in test scores between the EEG group as a whole and those of the normal population, it was decided to ascertain whether any one particular group of subjects was responsible for the lower scores. For example, it could be expected that the behaviour problem group (Group III), could have better intellectual potential than the head-injury and epilepsy group (Group I) but possibly a more negative attitude to schooling and to the tests.

TABLE II : AGE AND TEST SCORES : MEANS AND STANDARD DEVIATIONS OF TOTAL SAMPLE, AND GROUPS I, II AND III.

VARIABLE		TOTAL SAMPLE			GROUP I			GROUP II			GROUP III		
		$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N
AGE		19,98	3,86	68	20,52	4,47	26	19,61	2,42	19	19,47	3,17	23
Intermediate Battery	Mental Alertness	15,01	4,54	20	16,67	4,23	6	15,33	5,13	6	13,63	4,44	8
	Arithmetical Problems	8,89	5,01	19	9,29	5,38	7	9,40	5,94	5	8,14	4,67	7
	Reading Comprehension	9,84	4,26	19	10,50	3,94	6	8,33	4,50	6	10,57	4,61	7
	Vocabulary	13,53	4,46	19	14,83	3,92	6	12,50	2,07	6	13,29	6,37	7
Raven's A/15		27,45	6,30	64	27,40	6,62	24	26,84	6,65	19	28,48	5,76	21
High Level Battery	Mental Alertness	19,34	7,08	44	18,00	5,02	16	20,54	9,47	13	19,73	6,82	15
	Arithmetical Problems	5,30	2,83	43	4,47	2,17	15	5,85	3,98	13	5,67	2,16	15
	Reading Comprehension	9,21	3,64	43	9,47	2,59	15	9,23	4,59	13	8,93	3,85	15
	Vocabulary	12,23	5,86	43	12,33	6,16	15	12,54	6,01	13	11,87	5,83	15

Application of the Kruskal-Wallis one-way analysis of variance (Siegel, 1956) to the scores obtained on the tests showed that the groups did not differ significantly from each other in terms of any of these variables. Table II shows mean test scores for the three groups.

Table III shows the H-values of the groups.

TABLE III : ONE-WAY ANALYSIS OF VARIANCE BY RANKS ON TEST SCORES FOR GROUPS I, II AND III (KRUSKAL-WALLIS)

Test		H	N
Raven's Progressive Matrices		1,345	64
Intermediate Battery	Mental Alertness	3,484	20
	Arithmetical Problems	,222	19
	Reading Comprehension	3,383	19
	Vocabulary	1,854	19
High Level Battery	Mental Alertness	2,606	44
	Arithmetical Problems	2,299	43
	Reading Comprehension	1,225	43
	Vocabulary	,021	43

Footnote: None of the H-values shown here is significant

7.1 Reclassification of the groups

In view of the fact that these results suggest that the groups in the EEG sample do not differ from one another, the classification exercise could possibly be regarded as redundant. However, the data was regrouped, not according to severity of complaint, but in terms of type of complaint to ascertain whether differences in intellectual and scholastic abilities exist.

Group A (Epilepsies) comprised epileptics, cases reporting isolated black-outs and clients with epileptogenic symptoms. (N = 18).

Group B (Head-injuries) comprised head-injury, and slight head-injury sub-groups and excluded the "congenital" brain damage cases. (N = 23)

Group C comprised school and behaviour problems. (N = 21)

The Kruskal-Wallis one-way analysis of variance by ranks (Siegel, 1968) on the Raven's Progressive Matrices only, again yielded insignificant results: H = 0,195 (N = 62). It was thus decided not to pursue this line of investigation. At least it can be assumed that the counselling given was probably not affected by differences in measured intellectual or scholastic ability in the three groups. The original classification was therefore retained.

8. EEG RESULTS

The EEG results were classified as normal, mildly abnormal, moderately abnormal and abnormal (See 4.3).

8.1 EEG Abnormality Displayed in the Groups

Of the total group of 68 only 12 cases had normal EEGs, i.e. 18 percent. These findings are shown in Table IV.

TABLE IV : INCIDENCE OF EEG ABNORMALITY IN GROUPS I, II AND III (EIGHT SUB-GROUPS)

	GROUP I (N = 26)			GROUP II (N = 18)			GROUP III (N = 23)		TOTALS
EEG FINDINGS	Epilepsy	Head Injury	Brain Damage	Isolated Black-outs	Slight Head Injury	Epilepsy Syndrome	Serious Problems	Mild Problems	
Normal	0	2	2	3	0	0	1	4	12
Mildly abnormal	0	7	0	1	3	1	2	5	19
Moderately abnormal	1	6	1	1	2	2	3	3	19
Abnormal	5	2	0	4	1	1	2	3	18
TOTALS	6	17	3	9	6	4	8	15	68
Percentage Normality in Groups	15%			15%			21%		18%

Table IV shows that 82 percent of the total group showed EEG abnormality. Excluding the clinical group (Group I) completely, the percentage EEG abnormality is 81 percent. However, adding those that are mildly abnormal (EEGs in this category can be considered as being within normal limits) to the normal group, the percentage EEG abnormality drops to 45 percent. The incidence of EEG abnormality in the normal population can vary between five percent and ten percent, according to Williams (1941). In late adolescence an EEG abnormality up to 25 percent has been noted (Cobb, 1963; Hill, 1963)

It has been reported that 26 percent of neurotic patients show an EEG abnormality. The percentage of EEG abnormality for different samples of psychopathic personality varies from 45 percent to 75 percent. Group III may be equated to some extent with the above samples. Only five in the group had normal EEG recordings; seven were classified as mildly abnormal (i.e. borderline and more or less within normal limits). These two categories together formed 52 percent of the group. This figure thus falls within the expected range.

8.2 Type of EEG Abnormality Displayed in the Groups

When the EEG results are classified according to the type of electrical activity displayed (see 4.3) it is found that 28 percent of the total group showed some form of epileptiform activity, 31 percent maturation defect or cortical immaturity and 16 percent cortical dysfunction. Table V shows how these abnormalities were distributed in terms of these types.

TABLE V : TYPE OF EEG ABNORMALITY FOUND IN GROUPS I, II AND III AND SUB-GROUPS

	GROUP I			GROUP II			GROUP III		
TYPE OF EEG ABNORMALITY	Epilepsy	Head Injury	Brain Damage	Isolated Black-outs	Slight Head-injury	Epilepsy Syndrome	Serious Problems	Mild Problems	TOTALS
Epileptiform	5	2	0	5	1	0	3	3	19 (28%)
Compatible with Head-injury	0	4	0	0	1	0	0	0	5 (7%)
Cortical Immaturity and Maturation Defect	0	3	0	1	3	3	4	7	21 (31%)
Cortical Dysfunction	1	6	1	0	1	1	0	1	11 (16%)
Normal	0	2	2	3	0	0	1	4	12 (18%)
TOTALS	6	17	3	9	6	4	8	15	68

In the clinical group (Group I), as would be expected, of the six known epileptics, five showed epileptiform activity and the "infantile convulsion" case showed a non-specific though disturbed record. Nevertheless, six of the total 19 records showing epileptiform activity came from Group III, where no case history of such disturbances was reported.

Perhaps the most interesting aspect of Table V is that 48 percent (11 out of 23) of Group III showed cortical immaturity or maturation defects.

9. IMPLICATIONS OF EEG RESULTS FOR COUNSELLORS

A counselling relationship and what goes into it and what results from it cannot readily be described or measured; too many variables play a role in the final outcome to pinpoint any one specific aspect of the counselling process as being the most significant. The effect that the counselling has on the clients or their parents and whether the counselling outcome is satisfactory are matters rather too complex to quantify and evaluate without mounting a full-scale follow-up and re-testing process. This would have been an almost impossible task, in view of the fact that the clients came from all over the country. A small number of them did form part of a larger follow-up survey and some information has been gleaned from this and from chance meetings with clients or parents afterwards and from return-visits of the clients or their siblings.

It must be stated categorically that the EEG results were at no time discussed with clients or their parents, without the mediation of their doctors; the clients were told that they could discuss any results with their doctors if they wished to do so and any further actions were based exclusively on medical opinion. Perhaps it was the counsellors who benefited most from the EEG results - having the satisfaction of knowing that they had tried their best to cover all possibilities.

The EEG results were interpreted, as all other variables were, in relation to the unique circumstances of each individual client. They played a part in influencing, directly or indirectly,

counselling strategies and recommendations and referrals to other agencies. The following case studies serve as examples of the type of counselling given and some outcomes are reported. The case studies are preceded by general comments about the relevance of the type of EEG abnormalities presented and possible effects on study, career patterns and occupational choice.

9.1 Counselling clients with epileptiform activitiy in the EEG recordings

Epileptics very often have problems associated with their jobs. Training for and obtaining suitable positions can be problematic and their employability depends on the extent to which the seizures are controlled and whether the medication leaves them alert enough to cope with their work. Three of our group were on medication, one had been off medication for three years (the EEG nevertheless showed evidence of petit mal). A further complicating factor is that a counsellor can never be sure of the consistency and accuracy of the test results of an epileptic as both the underlying physiological causes and/or the medication can inhibit effective mental functioning in tests and job performance.

However slight a lapse of consciousness is, the possibility exists that, in certain circumstances, an epileptic can expose himself and others to danger. Where epileptiform activitiy is present, cognizance should probably be given to this fact and care taken in the type of career recommendation made. Where clinical signs are clear however, jobs should probably not include work with machinery with moving parts or where the hazard of physical danger is high (e.g. in engineering and construction work) or where close attention has to be paid in the operation of machinery and vehicles (e.g. crane and hoist driving, engine driving, air traffic control, heavy duty driving, surgery, dentistry, etc.). Even in cases where epilepsy is recognised and controlled, medical authorization has to be obtained before driver's licences and certain jobs in industry can be given to epileptics. Legal prohibitions also ban epileptics from certain occupations within factories. Selection boards for some occupations (e.g. for teachers and nurses) do not accept epileptics. Many firms are

hesitant about employing epileptics in positions involving contact with the public or where they could be an embarrassment or hindrance to other staff members if they had a seizure.

Epileptic-type episodes causing the minutest break in concentration can be a grave disadvantage in any class-room or lecture theatre, contributing towards non-achievement and its concomitant stress and behavioural problems. The association of tension and emotional strain with an increase of frequency of epileptic attacks is well known. In four of the cases with epileptiform EEGs a lower level of study than was aspired to was recommended, though these recommendations were not made solely on grounds of health.

i) One young man whose epilepsy was reasonably well controlled, wanted to study medicine but was warned against this. A diploma course in a scientific direction was offered as an alternative. Three years later he was following this course of action satisfactorily.

ii) An epileptic girl with a number of school problems was advised to attend a smaller private school that would allow her more individual attention from the staff and enable her to have remedial reading lessons to lessen the strain she had been experiencing in the ordinary class-room situation. She was advised to investigate practical career options (e.g. tracing, floristry) rather than more academically oriented occupations.

iii) Two of the group were strongly pressurized by the family to achieve academically. Parents were counselled to allow their youngsters to set their own study patterns and programmes and to lessen the pressures they placed upon them. This advice seemed to be particularly pertinent in a case where recognition had not previously been given to the possibility of underlying physiological causation of concentration problems. The parents seemed relieved to know that the youngster was not merely idle or intellectually incompetent.

iv) One school-girl was concerned that she was not achieving the school marks that both her test results and her conscientious application deserved. She mentioned that she suffered periodically from a buzzing in her ears that made concentration difficult and left her with a head-ache. A specialist had said that she had nothing wrong with her ears. On the basis of the EEG report, a neurologist was consulted and she was placed on a small daily dose of phenobarbitone.

v) One of the cases who was thought by the counsellor to have psychopathic tendencies was referred to a neurologist, who in consultation with the father of the boy, agreed to ignore the EEG findings for fear of "making (him) a little neurotic, on top of his asocial tendencies". Nevertheless the neurologist made it clear to the parents that the boy was "at risk" and could develop epilepsy.

vi) Several cases that displayed mild epileptogenic abnormalities were advised to consult their doctors for general check-ups. Two-and-a-half years later one of these reported that he had settled down well; he said that he had regular physical checks and felt that he had "grown up a bit".

vii) One of the suspected epileptics (a matriculant) was advised to have further neurological investigation. He changed his course from engineering to architecture and has successfully completed his university studies. He is now, ten years later, practising as an architect, concentrating on design.

viii) One youngster was referred to a clinical psychologist and to his doctor, but since neither of his parents was prepared to discuss the case at all with the counsellor, it is unknown what eventually transpired.

ix) A young boy who was not doing at all well at school was held back for his matric year. He reported a head injury at the age of 13, when his head had been caught between two stands that were being moved on a sportsfield; he had lost consciousness for about fifteen seconds only. The counsellor

referred him for EEG investigation. Before the EEG was recorded he revealed that he had severe head-aches (one a week), blacked out on occasion when he stood up suddenly and also in infancy had had an operation during which he had lost a great deal of blood.

The EEG revealed clear epileptogenic disturbances and the boy was referred to his general practitioner who referred him to a neurosurgeon. A repeat EEG confirmed the NIPR findings and anti-convulsant therapy was prescribed. A follow-up three months later revealed that his head-aches had disappeared, his concentration had improved, he had no more blackouts and he was more relaxed. As a result of the neurosurgeon's recommendation he was allowed extra time for his examinations and was achieving considerably better. The father, who imparted this information, was clearly delighted that an improvement had resulted.

9.2 Counselling clients with EEG recordings consistent with head-injuries.

EEG records of clients with a history of head injury often display generalized or lateralized cortical dysfunction. From a counselling point of view, if epilepsy is also present this is taken into consideration, together with specific physical, psychological and intellectual factors e.g. co-ordination, depression, mental retardation or behaviour deviation.

In this study, in very few cases was the brain damage so severe as to be incapacitating, and EEG confirmation of brain damage did not provide grounds for the elimination of career alternatives for clients who had already proved themselves able to cope with everyday working life.

Nevertheless, in some cases the EEG abnormality appeared, in part, to account for the restlessness and associated behaviour difficulties. In at least six cases where there was a history of some head injury, neither the clients nor their parents seemed to be aware of any possible relationship between problems of educational and

vocational adjustment and the accidents. It is a moot point whether it is in their interest, in fact, to make this association. In some cases such awareness may help parents to understand the problem more fully and to handle the social aspects of it more wisely. On the other hand, the "accident" can be used an an excuse for lack of effort and application. One youngster, who had been involved in a serious accident, did in fact admit to relying too heavily on the injury as an excuse for not studying consistently. He was prepared to try to apply himself more conscientiously.

Neither the parents nor the clients with a history of head-injury were informed about minor EEG abnormalities. They were merely thanked for participating in "the research project on concentration". It seems that many of such cases improved in time. The general follow-up some years after the EEG's were recorded revealed that at least four of the cases had settled down satisfactorily.

i) One of those displaying an EEG compatible with head-injury had matriculated, was at university and, according to the follow-up questionnaire, was showing signs of application and responsibility.

ii) Another youngster had joined the merchant navy - as recommended. He was on shore-leave and paid a social call to the NIPR, bringing his dog with him. He said he was enjoying navy life, which suited his restless temperament. He was studying for an engineer's "ticket".

iii) Another lad was well on the way to obtaining a degree.

iv) A young adopted girl who, when tested, was going through the gamut of adolescent rebellion, has now, eight years later, obtained a special qualification in child care and is happily employed. She had, in early childhood, been concussed after falling off a swing.

v) The father of one of the boys whose EEG showed evidence of cortical damage was a doctor, so the case was discussed fully with him. It is not known what action was taken, but it is known that the son did eventually matriculate from the tutorial college after four changes of high school.

9.3 Counselling clients with EEG recordings showing cortical immaturity.

Nearly a third of the total group referred had EEGs which, in the final analysis, were described as giving evidence of cortical immaturity or as maturation defects. Murdoch postulates that if Williams' paradox (as described in 3.1) is applicable to maturational anomalies as well as to head injuries, there is a better chance of a favourable prognosis for behaviour disorder cases showing maturation defects than for those with normal EEGs. Counsellors may, in these cases, hope for an improvement in the general behaviour of the client.

Many of the EEGs of the behaviour-problem group fell into the maturation defect category and, as in the case of the minor cortical dysfunction groups, it was only in very rare cases that direct further action relating to the EEG was taken.

Some of the behaviour-problem group had initially been referred by psychiatrists, who automatically received a copy of the report. Several cases were referred to clinical psychologists, psychiatrists and remedial specialists.

On the whole, partially as a result of the EEG results, the counselling centred round problems of social and emotional immaturity. The reports very often referred to the possibility that vocational stability would only occur at a later stage and that postponement of final career decisions could be beneficial. In other words, it was suggested that an overall improvement and vocational maturity would merely occur at a later stage than usual and that little would be gained by over-emphasizing present problems.

i) One case was referred to a neurologist, but it is not known whether he did in fact consult any specialist. He has, however, been employed quite satisfactorily as a plasterer and has held down this job for some years.

ii) One young man (referred by a social worker) had a poor school-history and a criminal record. He appeared to be withdrawn from reality and emotionally unstable. His alcoholic father was subject to uncontrolled fits of rage and aggression. At the time of testing the boy was making a reasonable adjustment at school and on an interpersonal level, already exhibiting some improvement. On-the-job training was suggested for him, preferably where he could be out of doors and away from his father. The merchant navy, where there is a measure of discipline and control, was recommended.

iii) A youngster of some intelligence, who had extremely poor verbal skills was underachieving at school. During the interview he fluttered his eyelashes rapidly as though the light was too bright for him. In the report it was suggested that since the EEG showed little sign of a neurological basis for his difficulty with reading, he should perhaps have remedial training. He was encouraged to be allowed to take more responsibility for himself and so develop more independence and maturity.

iv) An intelligent young man with a history of aggressive behaviour, was extremely shallow and flippant, and a plausible and fluent speaker - almost a typical example of the psychopathic personality. It was suggested that he should find a job where he would be treated sympathetically yet given the opportunity to display initiative and ingenuity. He obtained such a job and was able to hold it down fairly satisfactorily for about two years; from there he moved on to an entrepreneurial career. It is not known how he fared, though a newspaper described the marketing of a device that he had invented.

iv) A young man of average intellectual ability was underachieving scholastically and had had many changes of school. He appeared very negative and defeatist, felt he was a failure and became depressed. He was sensitive and over-protected by his parents, who were also interviewed. He passed Std 8 after the initial counselling, but was re-interviewed and given an EEG, nearly two years later. A year after that, although he liked the job in diamond cutting that had been suggested to him, he was discharged as "unsuitable" - no specific reasons were given. At this stage, aged 20, he was sent for psychiatric treatment and was awaiting admission to Tara. In this case there were discouraging signs of deterioration rather than improvement.

9.4 Counselling clients with normal EEG recordings

It is well known that a normal EEG by no means guarantees normal brain functioning or absence of pathology. The significance of EEG normality probably depends on the nature of the case.

9.4.1 Normal EEG recordings in the head-injury group

Two people in the "head-injury" group displayed normal EEG patterns.

i) One of these individuals was a young man who felt depressed and aggressive towards others. He was not happy in any job he tried. His spelling and writing were execrable and he had a poor school record; he seemed to be accident prone. It was only when he had the EEG that he mentioned a skull fracture at the age of thirteen. Though the EEG was within normal limits, an assessment of lateral dominance (HNTB(A)) indicated slightly reduced performance of the left hand, possibly related to right frontal brain damage. Whether the trauma was associated in any way with the apparent perceptual or learning problem and subsequent anxiety about his lack of progress is unclear. He was nevertheless counselled not to attempt further academic studies and not to worsen his financial situation (and anxiety) by resigning his job as an

artisan, as this seemed to be suitable in most respects. His problems were social and emotional. He was therefore referred to a clinical psychologist or to the Psychiatric section of the General Hospital.

ii) The other case had been in an accident four years previously and had suffered an arm and leg fracture, as well as a period of unconsciousness. He displayed tremendous motor restlessness (which is often present in cases with brain damage) and complained that he could not concentrate on his studies. He was shy, slightly paranoid and also depressed and lonely and could not get a job.

Prior to the accident, he had had polio; his parents were divorced and he was stuttering badly. At school he was underachieving and had been diagnosed as dyslexic. A study-methods improvement course was recommended, as well as relaxation classes. It was suggested that a general practitioner would also be able to recommend an occupational therapist and a clinical psychologist who would help him to get over his depression.

9.4.2 Normal EEG recordings in those with long-standing brain damage

It seems likely that the two normal EEGs recorded have a bearing on the fact that long-standing "static" brain damage may have rendered the area involved incapable of producing electrical activity and therefore of modifying the normal EEG generated by other intact cortical areas. This postulates that such brain damage is irreversible and not likely to improve over time.

i) One of these two boys was an obvious case of congenital mental retardation and jobs within his limited capabilities, in a sheltered environment were suggested. The driving licence he aspired to was not encouraged, especially as he had had a number of bicycle and scooter accidents.

ii) The other case was a matriculated boy, who had developed relatively good verbal skills, but whose reasoning ability was limited. He spoke knowledgeably about a number of technical subjects and, as a hobby, was keen on making working models that he designed himself, yet he had proved to be incapable of passing mathematics or science at the Std 8 level. He had attended normal schools, but had never adapted socially and had developed emotional problems for which he had been seeing a psychologist for a number of years. A love of speed, power, adventure and excitement was expressed. His parents seemed unrealistic in their aspirations for him, but were aware that in infancy a major operation may have resulted in oxygen deprivation.

The EEG recorded was normal; however, the Halstead Neuropsychological Battery indicated right post-central brain damage, which postulated a difficulty in the integration, organization and processing of perceptual information, at a fairly subtle level. It was suggested that this was possibly a limitation that would affect him in almost all walks of life. It was recommended that he should attend a remedial education centre and the effectiveness of this programme would determine future occupational progress, though the prognosis was not good. He was encouraged to continue his interest in model building and toy design.

His plans to get a pilot's licence were discouraged as being potentially dangerous. In this case, in consultation with medical specialists, exemption from military service was recommended.

The results of the counselling might not have been particularly constructive for the boy himself, especially from a career point of view. On the other hand, it might have given some solace to the parents to know that his problems were not entirely psychologically based. Possibly the knowledge that he was unlikely to be capable of taking responsibility for himself in the sort of careers they envisaged for him helped them to make long-term plans for his future security. It was assumed that the brain damage was more or less irreversible.

9.4.3 Normal EEG recordings in the Borderline Group

Where normal EEGs were recorded from people in this group, the findings were generally useful in counselling. EEG normality was interpreted as an indication of the possibility that fainting episodes were psychogenic in origin.

i) A girl who fainted in the foyer during the lunch-break on the day she was tested was referred for EEG investigation, since she had recently had a few fainting spells. She was an emotionally labile, tensed and anxious person, who was over-achieving at school in relation to her abilities. Attitudes at the school were highly competitive; she set high standards for herself and was motivated to study medicine. The family unit was close-knit, well-organized and over-protective.

The normal EEG pattern led to the assumption that her faints could possibly be psychogenic in origin. She was urged not to overstrain herself academically. A diploma in occupational therapy was suggested as an alternative to medicine, as this would involve more practical work, less intensive academic effort and less personal responsibility. The parents whole-heartedly agreed with this suggestion and let her understand they were not pushing her in any way to study medicine. She decided it would be advisable to work in a hospital during her holidays to see whether she could withstand the realities of working with sick people.

ii) A young man, an electroplater, had fainted several times at work, possibly as a result of the fumes arising from electro-plating processes. He was totally disinterested in the work itself. Clerical work seemed preferable as an alternative, as well as being safer. Two years later, however, he was still in electroplating, and still unhappy.

9.4.4 Normal EEG recordings in the behaviour and school problem group

There were more normal EEGs recorded from this group than from the other two groups.

i) A business executive in his late twenties had had a coronary thrombosis previously and feared that he had deteriorated intellectually. He complained that he was short-tempered and irritable. He was encouraged to have a thorough medical check-up first and advised to take up recreational and social activities to take his mind off his preoccupation with his ill-health and fr[illegible]on. A year later he had begun a BA degree through co[illegible]spondence, and had taken up pottery and Yoga. He wrote that he was feeling much better and that the counselling had been well worth while, but unfortunately did not mention whether he was less irascible at work.

ii) A young hotel-management trainee who found it difficult to concentrate was advised to consult a clinical psychologist and get some help regarding his inability to do the simple calculations required of him as a waiter. A year later he claimed that his numerical ability had, in fact, improved and he was continuing with his on-the-job training.

iii) A very immature youngster had had problems at school which remedial classes had not managed to alleviate. He had attended a special school for a few years in order to catch up with his peer group. His attitude was defeatist and he was restless, dissatisfied generally and keen to travel. Nevertheless he went into clerical work when he eventually matriculated, which was appropriate in terms of his interests and mediocre ability level. Five years later, he was still employed but he remained restless, finding it difficult to concentrate on his work.

In this case, there was no improvement and the complaint was long-standing, but, for want of clinical evidence it was assumed that the problem was essentially a behavioural one. A more sophisticated neuro-psychological measure might have been more effective for diagnostic purposes.

10. CONCLUSIONS

i) The group referred for EEG was different from a normal sample, since there was an overall EEG abnormality rate of 82 percent and 45 percent, if borderline cases were added to the normal group.

ii) The group scores on some tests, notably inductive reasoning, were lower than for a larger, "normal" group.

iii) The group was divided into three categories according to the severity of the clinical symptoms, but there were no differences in intellectual and scholastic abilities among these three groups.

iv) The high incidence of cortical immaturity and maturation defect in the EEG recordings of the behaviour-problem group are considered useful from a counselling point of view, as the prognosis for such people may be positive since there is a possibility of improvement in time.

v) EEGs showing epileptiform activity in the recordings of people with no overt clinical signs can be used beneficially if referred for neurological investigation and treatment.

vi) Clients with "static", long-standing brain damage should be tested on the full neuropsychological battery, as well as the EEG.

vii) In certain cases the EEG was useful to the counsellors as some fainting attacks were diagnosed to be probably, though not certainly, of psychogenic rather than epileptogenic origin.

viii) EEG findings may be useful as an aid to counselling, provided that they are considered as an extra variable, possibly contributing additional information to the sum total of information about the individual.

ix) Counsellors are advised to bear in mind that ambiguities in behaviour and achievement patterns that may possibly be combined with EEG-related physical symptoms could profitably be investigated further in many cases.

x) Further investigations into the role that electroencephalographic assessment can play in vocational counselling does not, at this stage, seem warranted from a research point of view. Refinement of neuropsychological measures and the use of more sophisticated techniques may in future open up greater possibilities for diagnosis and consequently improve the quality of vocational counselling. A project embodying this approach should be considered once relevant test material becomes available.

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